

CLAIMS

1. A deposit conveyance mechanism comprising:

a conveying tube having a suction port opened and faced a bottom face of a water storing place on which deposits are deposited, a vertical tube part vertically extending upward from the suction port, a horizontal tube part horizontally extending sideward from an upper portion of the vertical tube part to a discharge section whose level is lower than water level of the water storing place, said horizontal tube part liquid-tightly pierced through a bank hole of the water storing place whose level is lower than the water level of the water storing place, held in the water of the water storing place so as to locate below a hydraulic gradient line and vertically moved so as to move the suction port close to and away from the bottom face of the water storing place, by an elevating unit, in a prescribed cycle;

a cup-shaped member provided to the suction port of said conveying tube, said cup-shaped member having a lower part in which the suction port is capable of moving upward and downward;

a steam supplying section supplying steam into said cup-shaped member; and

a compressed gas supplying section supplying a compressed gas into said cup-shaped member.

2. The deposit conveyance mechanism according to claim 1, wherein pressure in the suction port is lowered by inertia of a fluid in said conveying tube, expansion waves are generated and water column separation is caused in a low concentration part of said conveying tube from the suction port when the suction port moves downward together with the cup-shaped member and runs into the bottom face of the water so as to rapidly close the suction port;

highly concentrated deposits on the bottom of the water and water, steam and compressed gas in said cup-shaped member are introduced into the suction port and plug and gas plug including the highly concentrated deposits goes upward in the vertical tube section when the suction port is moved upward with respect to said cup-shaped section, a high concentration part in the suction port is sucked as the plug, a small volume of the compressed gas is supplied into said cup-shaped member from said compressed gas supplying section and the steam, whose volume is greater than that of the compressed gas, is supplied into said cup-shaped member from said steam supplying section; and

a coupled vibration-like flow including a solid phase, a liquid phase and a gas phase is generated in said conveying tube so as to convey the deposits to the discharge section by repeating a step of lifting said cup-shaped member, in which supplying the steam and the compressed gas is stopped so as to condense the steam of the gas plug and reduce the volume of the gas plug, and a step of rapidly opening the suction port, in which clear water is introduced into the suction port so as to increase the pressure in the suction port and generate pressure waves to condense the water column separation.

3. The deposit conveyance mechanism according to claim 1, wherein said compressed gas supplying section supplies compressed air or compressed carbon dioxide gas.

4. The deposit conveyance mechanism according to claim 2, wherein said compressed gas supplying section supplies compressed air or compressed carbon dioxide gas.

5. The deposit conveyance mechanism according to claim 1, further

comprising a boat floating on a surface of water in the water storing place, wherein a suspending unit suspending said conveying tube, the elevating unit for vertically moving said conveying tube so as to move the suction port close to and away from the bottom face of the water storing place in the prescribed cycle, said steam supplying section and said compressed gas supplying section are provided in said boat.

6. The deposit conveyance mechanism according to claim 2, further comprising a boat floating on a surface of water in the water storing place, wherein a suspending unit suspending said conveying tube, the elevating unit for vertically moving said conveying tube so as to move the suction port close to and away from the bottom face of the water storing place in the prescribed cycle, said steam supplying section and said compressed gas supplying section are provided in said boat.

7. The deposit conveyance mechanism according to claim 3, further comprising a boat floating on a surface of water in the water storing place, wherein a suspending unit suspending said conveying tube, the elevating unit for vertically moving said conveying tube so as to move the suction port close to and away from the bottom face of the water storing place in the prescribed cycle, said steam supplying section and said compressed gas supplying section are provided in said boat.

8. The deposit conveyance mechanism according to claim 4, further comprising a boat floating on a surface of water in the water storing place, wherein a suspending unit suspending said conveying tube, the elevating unit for vertically moving said conveying tube so as to move the suction port close to and away from the bottom face of the water storing place in the prescribed cycle, said steam supplying section and said compressed gas

supplying section are provided in said boat.

9. The deposit conveyance mechanism according to claim 1, further comprising a pressure absorbing section communicated with said conveying tube, said pressure absorbing section being capable of absorbing variation of pressure in said conveying tube.

10. The deposit conveyance mechanism according to claim 2, further comprising a pressure absorbing section communicated with said conveying tube, said pressure absorbing section being capable of absorbing variation of pressure in said conveying tube.

11. The deposit conveyance mechanism according to claim 5, further comprising a pressure absorbing section communicated with said conveying tube, said pressure absorbing section being capable of absorbing variation of pressure in said conveying tube.

12. A method for conveying deposit in a mechanism including a conveying tube having a suction port opened and faced a bottom face of a water storing place on which deposits are deposited, a vertical tube part vertically extending upward from the suction port, a horizontal tube part horizontally extending sideward from an upper portion of the vertical tube part to a discharge section whose level is lower than water level of the water storing place, said horizontal tube part liquid-tightly pierced through a bank hole of the water storing place whose level is lower than the water level of the water storing place, held in the water of the water storing place so as to locate below a hydraulic gradient line and vertically moved so as to move the suction port close to and away from the bottom face of the water storing place, by an elevating unit, in a prescribed cycle; a cup-shaped member

provided to the suction port of said conveying tube, said cup-shaped member having a lower part in which the suction port is capable of moving upward and downward;

a steam supplying section supplying steam into said cup-shaped member; and a compressed gas supplying section supplying a compressed gas into said cup-shaped member, said method comprising the steps of:

moving the suction port together with said cup-shaped member until the suction port runs into the bottom face of the water so as to rapidly close the suction port, reduce pressure in the suction port by inertia of a fluid in said conveying tube, generate expansion waves and cause water column separation in a low concentration part of said conveying tube from the suction port;

moving the suction port upward with respect to said cup-shaped member so as to suck a high concentration part in the suction port is sucked as plug, supply a small volume of the compressed gas into said cup-shaped member from said compressed gas supplying section, supply the steam, whose volume is greater than that of the compressed gas, into said cup-shaped member from said steam supplying section and make the plug and gas plug including the highly concentrated deposits go upward in the vertical tube section; and

repeating a step of lifting said cup-shaped member, in which supplying the steam and the compressed gas is stopped so as to condense the steam of the gas plug and reduce the volume of the gas plug, and a step of rapidly opening the suction port, in which clear water is introduced into the suction port so as to increase the pressure in the suction port and generate pressure waves to condense the water column separation, so as to generate coupled vibration-like fluid including a solid phase, a liquid phase and a gas phase is generated in said conveying tube so as to convey the deposits to the discharge section.

13. The method according to claim 12, wherein said compressed gas supplying section supplies compressed air or compressed carbon dioxide gas.

14. The method according to claim 13, wherein said mechanism further includes a boat floating on a surface of water in the water storing place, wherein a suspending unit suspending said conveying tube, the elevating unit for vertically moving said conveying tube so as to move the suction port close to and away from the bottom face of the water storing place in the prescribed cycle, said steam supplying section and said compressed gas supplying section are provided in said boat.

15. The method according to claim 13, further comprising a pressure absorbing section communicated with said conveying tube, said pressure absorbing section being capable of absorbing variation of pressure in said conveying tube.

16. The method according to claim 14, further comprising a pressure absorbing section communicated with said conveying tube, said pressure absorbing section being capable of absorbing variation of pressure in said conveying tube.